Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/410
FINLAND
February 1964
Original: ENGLISH

Confidential until official release during Conference

Abstract

An Approach to the Solution of the Two-Group Neutron Diffusion Equations in XY-Geometry

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A new semianalytical technique is described for finding the eigenvalues and the two-group fluxes in a two-dimensional rectangular reactor core surrounded by an infinite homogeneous reflector. The method of solution is an extension of the technique previously developed for one-dimensional problems. By introducing Green's functions for the infinite reflector region, the group diffusion equations and the corresponding boundary conditions are converted into a system of two-dimensional integral equations. In solving these equations the double Hankel transformation is applied. In the Hankel transformed Fredholm equations of the second kind the integral operators can be approximated by degenerate ones, and the problem reduces to the solution of infinite systems of linear algebraic equations. Solving the corresponding truncated finite system an approximate solution is constructed in transform space. The corresponding solution in coordinate space is then found by an inverse Hankel transformation. The method is not restricted to two-dimensional problems. Problems involving more complex reactor configurations, e.g. a three-dimensional, completely reflected rectangular block or a finite cylindrical core with both radial and axial reflectors, are also amenable to treatment by the method.